NASA

*Exploration Transportation
Strategic Roadmap*

Committee Discussion

"Vague and nebulous is the beginning of all things…"

Kahlil Gibran,
The Prophet

This First Meeting—Our Goals

- **Build consensus on the boundaries of the Exploration Transportation Roadmap**

- **Provide an introduction to some potential roadmap inputs**

- **Discuss strategies for developing the details of the roadmap**

- **Begin to identify gaps in knowledge or understanding**

- **Brainstorm to provide inputs for staff analysis and synthesis**

- **Identify requirements, actions, and desired content for our next meeting**

Approach

- **Day One**
  - **Background, "ticklers," and food for thought**
  - **Introduction to potential roadmap framework**

- **Evening, Day One**
  - **Break to "sleep on it"**

- **Day Two**
  - **Open discussion**
  - **We'll provide some questions as catalysts**
  - **We hope to hear your brainstorming…**
  - **Staff engineers will listen, record—and then go home to synthesize the results**

- **Next meeting**
  - **Provide additional background as desired**
  - **Present the synthesized product for discussion and modification**

Agenda
February 4, 2005

- *8:00 Review of Strawman Roadmap* **Committee Members**

- *11:00 Preparation for Next Meeting* **Lisa Guerra**

- *12:00 Adjourn*

- **Roadmap must be broadly applicable to Exploration (big E), not exploration (little e)**
  - **Rewrite charter**
  - **Consider transportation needs for all NASA missions**

- **Roadmap must encourage entrepreneurial endeavors—to increase likelihood of breakthroughs**

- **We need a clear, easy-to-understand depiction of Vision – Mission – Goals/Objectives**

- **We need to understand requirements *drivers***

- **We need to capture risk tolerance as an independent variable within our roadmap**

- **We need to look at pragmatic partitions**
  - **Items that _differentiate_ architectures vs items than _enhance all_ architectures**
  - **Items that are answerable in the _near-term_ vs items that are answerable in the _far-term_**
  - **Hierarchy of questions**

- **We need planning that provides adaptation when projected technology does not pan out**

- **We should develop a checklist—criteria to help us confirm we've built a complete roadmap**

- **We need to ensure our focus is broad—not just launch vehicle-centric**

- **We'd like to hear the committee's views on how best to focus our efforts…**

- **We've proposed a set of questions to help lead the discussion…**

- **Staff will listen, take notes—and try to incorporate the major themes into our next iteration.**

- **What features of the strawman roadmap did you like?**

- **What features of the strawman roadmap did you dislike?**

- **What key themes / messages should this roadmap communicate and reinforce?**

- **What are the highest priority considerations or issues for these roadmaps—i.e., the first tier of our potential hierarchy?**

- **How can we structure a roadmap to show trades that could encourage / inspire entrepreneurial activity to increase opportunities for breakthroughs?**

- **How broadly should we define the exploration transportation roadmap?**
  - **Crew Vehicle, Cargo, Launch Vehicle, Supporting Infrastructure?**
  - **As above, plus supporting activities like habitats, in-situ resources?**

- **How should we incorporate budget considerations into our roadmap development?**

- **How will we know we've successfully completed our roadmap? Can we define a checklist?**

- **Should we build the roadmaps by spirals or by increments of time?**

- **Should we consider a set of strategic implementation scenarios which would "overlay" the roadmaps? For example:**
  - **Commercial Focused**
  - **Traditional USG Acquisition**

- **Are there elements of exploration transportation we have NOT yet captured?**

- **Are there effective ways to maintain adequate interaction with linked roadmaps while we develop them in parallel?**

- **Are there other questions we should be asking?**

- **What features of the strawman roadmap did you like?**

  - **Nice, compact format**

Proposed Items for Discussion

- **What features of the strawman roadmap did you dislike?**

- **Suggestions:**

  - **Need to address C4 in roadmap**

  - **Address policy/operational questions/aspects, not just technical questions**

  - **Show linkages to more detailed information for technologies**

  - **Overlay spirals**

Proposed Items for Discussion

- **What key themes / messages should this roadmap communicate and reinforce?**

    - **Need to incorporate how we deal with risk (policy issue)**

    - **Need plan to show national value, include inspirational aspects as well as spin-offs**

    - **Need to invest in enabling technologies early in the program and show linkages to program success**

    - **Leverage expertise across complex (government agencies, Industry, academia)**

    - **Importance of education to success**

    - **Need to maintain/develop human capital to enable Exploration Transportation Systems**

Proposed Items for Discussion

- **What are the highest priority considerations or issues for these roadmaps—i.e., the first tier of our potential hierarchy?**

  - **Prioritization needs to make sense to general public, not just "insiders"**

  - **Prioritization needs to reflect core values**

  - **How do you identify irrevocable decisions?**

  - **Branch of questions centered on essential technologies**

  - **Distinguish questions**

    - **That affect all architectures vs. just some**

    - **Are of interest outside NASA versus those of interest just inside NASA**

    - **Those that can be modeled near term vs. those that need development**

Proposed Items for Discussion

- How can we structure a roadmap to show trades that could encourage / inspire entrepreneurial activity to increase opportunities for breakthroughs?

- Examples to consider:

  - Transportation architectures should make accommodation for and plans to utilize personal spaceflight earth to LEO launch services once they are developed and are safe, reliable and cost effective. (Open architectures)

  - Plans should be made for the purchase of fixed price ($/kg) delivery of cargo to points of interest similar to early airmail contracts

  - Launch capacity developed by NASA should be made available to industry on preferential terms for the personal spaceflight market similar to the commercialization of the KC-135→to the 707 (dual use)

  - Exploration missions should seek to share costs and/or capacity with entertainment and industry endeavors

  - Centennial challenges for launcher /landers should seek to establish radical breakthroughs by setting very aggressive goals with a willingness to take greater risks

  - Missions should establish standard hardware interfaces in consultation with industry that will allow non-conventional providers to offer better price or performance services in the future

- **How broadly should we define the exploration transportation roadmap?**
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  - **As above, plus supporting activities like habitats, in-situ resources?**

- **How should we incorporate budget considerations into our roadmap development?**

- **How will we know we've successfully completed our roadmap? Can we define a checklist?**

  – **Yes, see next presentation**

- **Should we build the roadmaps by spirals or by increments of time?**

  - **Both, overlay spirals on roadmap**

- **Should we consider a set of strategic implementation scenarios which would "overlay" the roadmaps? For example:**
    - **Commercial Focused**
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